CLAIMS:

1. An orthopedic fixation system for fixing a bone having an exterior cortical portion and a non-cortical interior portion to an element which is a bone fragment or a prosthesis, comprising a length of flexible, inelastic cord; a first fastener for attaching the cord to said element; a second fastener for attaching the cord to the bone and enabling the cord to extend from said first fastener within the non-cortical interior of the bone to the second fastener, at least one of the fasteners having an opening through which the cord may pass from the interior of the bone to the exterior to enable said element to be securely mounted to the bone portion, and an axially rigid tubular support sized to permit the cord to extend through it.

2. The orthopedic fixation system of claim 1, wherein the tubular support comprises a series of segments.

3. The orthopedic fixation system of claim 2, wherein at least one of the segments is threaded.

4. The orthopedic fixation system of claim 1, wherein the tubular support is threaded.

5. The orthopedic fixation system of claim 1, wherein the tubular support is sized such that the bone and the bone fragment or prosthesis are distracted from one another.

6. The orthopedic fixation system of claim 1, wherein the tubular support is sized such that when the tubular support is flush against a cortical surface of the bone, tension on the cord will draw the bone and bone fragment or prosthesis together.

7. The orthopedic fixation system of claim 1, wherein the tubular support includes pharmaceuticals for release into the fracture site.

8. The orthopedic fixation system of claim 1, wherein the tubular support includes antibiotics for release into the fracture site.

9. The orthopedic fixation system of claim 1, wherein the tubular support contacts and extends between the bone and the bone fragment or prosthesis.

10. The orthopedic fixation system of claim 1, wherein at least one of the fasteners includes an opening through which said cord passes from the interior of the bone to the exterior, said at least one fastener including a lock for locking the cord to the fastener through which it passes.

11. The orthopedic fixation system of claim 10, wherein at least one of the fasteners includes a threaded portion adapted to be screwed into bone.

12. The orthopedic fixation system of claim 1, wherein the element is a bone fragment resulting from a fracture of the bone, the bone fragment and bone having mating fracture surfaces that are prevented from separating by the cord extending between them.

13. The orthopedic fixation system of claim 12, wherein at least one of the fasteners includes an elongated toggle portion adapted to pass in a generally coaxial direction through a bore formed in the bone or bone fragment and to assume a position generally normal to the axis against an outer surface of the bone or bone fragment.

14. The orthopedic fixation system of claim 12, wherein at least one of the fasteners includes a threaded portion adapted to be screwed into bone.

15. The orthopedic fixation system of claim 12, wherein at least one of the fasteners includes a bone plate adapted to engage a bone surface.

16. The orthopedic fixation system of claim 12, further including a third fastener fastenable to bone and having a surface within said interior over which said cord may be movably trained to change the direction of said cord between the first and second fasteners.

17. The orthopedic fixation system of claim 12, wherein at least one of the fasteners includes an opening through which the cord passes from the interior of the bone to the exterior, the at least one fastener including a lock for locking the cord to the fastener through which it passes.

18. The orthopedic fixation system of claim 17, wherein the opening comprises a bore at least partially threaded and within which the cord extends, and wherein the lock comprises a threaded member threadingly received in the bore and capable of engaging the cord to restrain cord movement.

19. The orthopedic fixation system of claim 1, further including a tensioning instrument adapted to contact the cord and at least one of said fasteners to place the cord in tension by drawing the cord outwardly through said fastener.

20. A bone fracture reduction system for reducing and promoting healing of a bone fracture of a bone normally having an exterior cortical portion and a non-cortical interior portion and having bone fragments with generally confronting fracture surfaces, comprising an internal fastener from within the non-cortical interior to a first bone fragment, a second fastener attachable to a second bone fragment, a length of flexible, inelastic cord having substantially no axial compressive strength and extendable within said bone interior and attached to said internal fastener and the second fastener, the internal fastener, the second fastener, and the cord being so positioned as to draw respective fracture surfaces together to reduce the fracture upon tensioning

of the cord between the internal fastener and the second fastener, and an axially rigid tubular support sized to permit the cord to extend through it.

21. The bone fracture reduction system of claim 20, wherein the tubular support includes pharmaceuticals for release into the fracture site.

22. The bone fracture reduction system of claim 20, wherein the tubular support includes antibiotics for release into the fracture site.

23. The bone fracture reduction system of claim 20, wherein the tubular support includes antibiotics for release into the fracture site.

24. The bone fracture reduction system of claim 20, wherein the tubular support comprises a series of segments.

25. The bone fracture reduction system of claim 20, wherein the tubular support is sized such that the first and second bone fragments are distracted from one another.

26. The bone fracture reduction system of claim 20, wherein the tubular support is sized such that when the tubular support is flush against one of the bone fragments, tension on the cord will draw the first and second bone fragments together.

27. The bone fracture reduction system of claim 20, wherein the tubular support contacts and extends between the first and second bone fragments.

28. The bone fracture reduction system of claim 20, further including a lock to restrain cord movement within the second fastener.

29. The bone fracture reduction system of claim 28, wherein the internal fastener includes a threaded portion screwed into the cortical portion from within the bone interior.

30. The bone fracture reduction system of claim 20, wherein the first bone fragment has an outer, cortical surface and wherein the first fastener includes an elongated toggle supported against the outer surface portion.

31. The bone fracture reduction system of claim 20, wherein the second fastener is an external fastener having a hollow interior through which the cord extends, the hollow interior being at least partially threaded, and further including a lock comprising a threaded member threadingly received in the hollow interior, the cord being operatively grasped between the threaded member and the hollow interior to restrain cord movement within the second fastener.

32. The bone fracture reduction system of claim 31, wherein the bone is a long bone having a medullary cavity, the internal fastener being attachable from within the medullary canal to one of the bone fragments and the length of flexible, inelastic cord extending from the internal fastener through the external fastener across a fracture interface and more closely adjacent one side of said medullary canal than the other side thereof, the bone fracture reduction system including a second flexible, inelastic cord and a third fastener, the third fastener being an external fastener and being attachable to the second bone fragment and through which the second cord extends, the second cord being arranged on generally the opposite side of said medullary canal from the first cord, whereupon the cords may be independently adjusted so as to resist bending moments applied at the transverse fracture site.

33. The bone fracture reduction system of claim 32, wherein the internal fastener comprises a pair of fasteners each having threaded portions threaded into the first bone fragment on opposite sides of the medullary canal.

34. The bone fracture reduction system of claim 32, wherein the internal fastener comprises an elongated fastener adapted for insertion and capture within the medullary canal of

the first bone fragment with the cords extending from the fastener adjacent opposite sides of the intermedullary canal.

35. The bone fracture reduction system of claim 20, wherein one bone fragment has a bore extending through its cortical portion and wherein the second fastener includes a plate adapted to engage the outer surface of the cortical portion of that bone fragment.

36. The bone fracture reduction system of claim 20, further including a third fastener fastened from the interior of the bone to a third bone fragment and having a pulley surface over which the cord is movably trained to change the direction of the cord within the interior of the bone.

37. The bone fracture reduction system of claim 20, further including a plurality of internal fasteners attached from within the bone interior to different ones of the bone fragments, the fasteners and cord being so positioned as to draw respective fracture surfaces of the bone fragments together to reduce the fracture upon tensioning of the cord.

38. The bone fracture reduction system of claim 36, wherein at least one of the internal fasteners includes a pulley surface over which the cord is movably trained to change the direction of the cord within the interior of the bone.

39. A Method for positioning fragments of a bone fracture with respect to each other to reduce the fracture and promote healing of a bone which normally has an exterior cortical portion and a non-cortical interior portion, the bone fragments having confronting fracture surfaces forming a fracture interface, the method comprising attaching from within the interior of the bone to a first bone fragment an internal fastener to which is attached a length of flexible, inelastic cord, advancing an axially rigid tubular support over the cord, and drawing the cord

through a bore formed in a second bone fragment to draw the fragments together in a direction to relieve the fracture.

40. The method of claim 39, wherein the tubular support contacts and extends between the first and second bone fragments.

41. The method of claim 39, wherein the step of advancing an axially rigid tubular support over the cord comprises advancing a series of segments together forming the tubular support over the cord.

42. The method of claim 39, further including the step of positioning the tubular support flush against one of the bone fragments, the tubular support being sized such that such positioning causes tension on the cord to draw the first and second bone segments together.

43. The method of claim 39, further including the step of positioning the tubular support such that the first and second bone fragments are distracted from one another.

44. The method of claim 39, wherein the tubular support includes pharmaceuticals for release into the fracture site.

45. The method of claim 39, wherein the tubular support includes antibiotics for release into the fracture site.

46. The method of claim 39, further including the step of securing the cord to the second bone fragment to restrain separation of the bone fragments at the fracture interface.

47. The method of claim 39, further including the step of determining the direction of tensile force desired to draw the fracture surfaces toward each other, and positioning the cord parallel to that direction.

48. The method of claim 39, wherein the internal fastener has a threaded end, the method including the step of screwing the threaded end from the interior of the bone into a cortical portion of said first bone segment.

49. The method of claim 39, wherein the internal fastener has an elongated toggle portion, the method including the step of forming a bore through the first bone fragment, and passing the toggle from the interior of the bone through the bore in the first bone fragment to position the toggle to lie against a cortical outer surface of the first bone fragment.

50. The method of claim 39, wherein the step of drawing the cord through a bone formed in a second bone fragment includes attaching to the second bone fragment an external fastener, drawing the cord through the external fastener, and locking the cord to the extended fastener.

51. The method of claim 50, further including the step of tensioning the cord by grasping the cord with a first potion of a tensioning instrument, contacting the external fastener with a second portion of the tensioning instrument, and operating the instrument so as to separate the first portion from the second portion.

52. The method of claim 39, further comprising the step of attaching a plurality of internal fasteners to different ones of a plurality of bone fragments, the flexible, inelastic cord being attached to each of the internal fasteners, wherein a plurality of axially rigid tubular supports are advanced over the cord, and positioning the plurality of internal fastener such that when the cord is tensioned, the fragments are drawn together to reduce the fracture.

53. The method of claim 52, wherein at least one of the internal fasteners includes a pulley surface over which the cord is movably trained to change the direction of the cord within

the interior of said bone, the method including the step of pulling the cord over the pulley surface.

54. The method of claim 52, wherein each of the internal fasteners includes a pulley surface over which the cord is movably trained to change the direction of the cord within the interior of the bone, the method including the step of pulling the cord over the pulley surfaces.

55. A method for reducing a bone fracture in a bone having a cortical exterior portion and a non-cortical interior portion, the bone having at least three bone fragments in which first and second fragments have first mating fracture surfaces and second and third bone fragments have second, different mating fracture surfaces, the method comprising attaching one end of a length of flexible cord from within the bone interior to the first bone fragment, attaching an internal pulley bearing the cord to the second bone fragment, the other end of the cord passing outwardly of the bone through an opening in the third bone fragment, advancing a first axially rigid tubular support over the cord between the first and second bone fragments and advancing a second axially rigid tubular support over the cord between the second and third bone fragments tensioning the cord to draw together said mating fracture surfaces to relieve the fractures, and securing the tensioned cord to said third bone fragment.

56. A method for reducing a bone fracture comprising at least two pairs of bone fragments, the first pair of bone fragments having first mating fracture surfaces and the second pair of bone fragments having second, different mating fracture surfaces, and wherein one bone fragment may be common to each of the first and second pairs, the bone having an exterior cortical portion and an interior non-cortical portion, the method comprising

a. attaching one end of a length of flexible cord from the interior of the bone to one fragment of the first pair, advancing a first axially rigid tubular support over the cord, and

extending the cord through an opening in the other bone fragment of the first pair in a direction so that when the cord is placed in tension, the first mating fracture surfaces are drawn toward each other;

b. attaching one end of a second length of flexible cord from the interior of the bone to one fragment of the second pair, advancing a second axially rigid tubular support over the cord, and extending the second length of cord extending through an opening in the other bone fragment of the second pair in a direction so that when the cord is placed in tension, the second mating fracture surfaces are drawn toward each other; and

c. appropriately adjusting tension in the cords with respect to each other to reduce the fracture surfaces.

57. The method of claim 56 including the step of securing the tensioned cords to the other bone fragments.

58. A method for reducing a bone fracture of a bone having a cortical exterior portion and a non-cortical interior portion, the fracture comprising at least three bone fragments each having fracture surfaces mating with fracture surfaces of the other fragments, the method comprising:

a. attaching from the interior of the bone to each of two of the bone fragments a fastener having a pulley surface over which is trained a length of flexible cord;

b. advancing an axially rigid tubular support over the cord;

c. drawing the cord through an opening in a third bone fragment and tensioning the cord to draw the fracture surfaces together; and

d. securing the cord to the third bone fragment to reduce the fracture surfaces.

59. Method for reducing a bone fracture of an elongated bone having a medullary canal and a generally transverse fracture dividing the bone into first and second bone fragments, comprising

a. attaching from the interior of the bone to one of said bone fragments an internal fastener from which extends at least two flexible, inelastic cord lengths;

b. advancing an axially rigid tubular support over each of the cords;

c. drawing the cord lengths through openings formed in the second bone fragment at spaced positions along the interior of the medullary canal of that fragment so that the cord lengths are spaced from one another within the medullary canal at the fracture site; and

d. securing the cords to the second bone fragment to reduce the fracture surfaces, the spaced cords resisting bending moments at the fracture site.

60. A bone fracture reduction system for use in reducing a fracture of a long bone producing first and second bone fragments, comprising an internal fastener adapted to be fastened to the interior of one bone fragment, a pair of flexible, inelastic cords attached to and extending from the internal fastener, a pair of axially rigid tubular supports each sized to receive one of the cords therethrough, and a pair of external fasteners attachable to the other of the bone fragments and having openings through which the cords may respectively pass on opposite sides of the medullary canal, whereby the cords may traverse the fracture site within the medullary canal on opposite sides thereof to resist bending moments at the fracture site.